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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/929,765	08/14/2001	Chih Chin Liao	56370	9374
21874	7590	02/24/2005	EXAMINER	
EDWARDS & ANGELL, LLP			WARREN, MATTHEW E	
P.O. BOX 55874			ART UNIT	
BOSTON, MA 02205			PAPER NUMBER	
			2815	

DATE MAILED: 02/24/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/929,765

Applicant(s)

LIAO, CHIH CHIN

Examiner

Matthew E. Warren

Art Unit

2815

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 06 January 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 6,8,11,13 and 14 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 6,8,11,13 and 14 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### DETAILED ACTION

This Office Action is in response to the RCE and Amendment filed on January 6, 2005.

#### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 6 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Applicant's Prior Art Figures 3 and 4 (APAF) in view of Takahama (JP 6-157238).

In re claim 6, the APAF 3 and 4 shows a BGA package a substrate 10 having a front and back side, a chip 20 mounted on the front side of the substrate, the chip having an array of bond pads 30B, an array of solder balls 40A on the back side of the substrate, and an array of bond fingers 60B beside the chip and electrically connected to the bond pads of that chip. An array of electrically conductive vias (72 & 74) penetrate from the front to the back side of the substrate and connect to the solder balls. The package also comprises a plurality of continuous electrically-conductive traces (70A-70D) for connecting a first subgroup of the bond fingers to corresponding ones of the vias. The continuous traces including at least one trace interposed between a second subgroup of the bond fingers and their corresponding vias. The APAF shows all of the elements of the claims except the electrically conductive bridge. Takahama shows (fig. 3 and abstract) shows a semiconductor device having traces (3, 4, and 5)

and a conductive bridge (8) in the form of a bond wire spanning in an overhead manner across the traces. The bond wire is free of the interposing traces and has an unfilled gap between the wire and traces. With this configuration, the density of wiring can be increased ultimately increasing the level of integration of the device. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the connections of the APAF by forming conductive bridges spanning over traces as taught by Takahama to increase the wiring density and ultimately improve the integration of the semiconductor device.

In re claim 14, when the APAF 3 and Takahama are combined the bonding wire of Takahama has one end electrically connected by a first trace to the corresponding via (80A) of the APAF 3, and the other end electrically connected by a second trace to the corresponding bond finger (60B) of the APAF 3.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Prior Art Figures 3 and 4 (APAF) in view of Takahama (JP 6-157238) as applied to claim 6 above, and further in view of Abrams (US 3,560,256).

In re claim 8, the APAF and Takahama show all of the elements of the claims except the bond wire made of gold. Abrams discloses a bridge/crossover that is made of gold wires or includes a resistor (col. 4, lines 3-6, & 25-31) and is free of interference with the electrically conductive trace due to the insulating material (27) between the bridge and traces. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the APAF and Takahama by employing

gold conductive bridge structures that cross over circuit traces as taught by Abrams to suitably increase the packing density of the circuit.

Claims 11 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Applicant's Prior Art Figures 3 and 4 (APAF) in view of Takahama (JP 6-157238) and Abrams (US 3,560,256)

In re claims 11 and 13, the APAF 3 and 4 shows a BGA package a substrate 10 having a front and back side, a chip 20 mounted on the front side of the substrate, the chip having an array of bond pads 30B, an array of solder balls 40A on the back side of the substrate, and an array of bond fingers 60B beside the chip and electrically connected to the bond pads of that chip. An array of electrically conductive vias (72 & 74) penetrate from the front to the back side of the substrate and connect to the solder balls. The package also comprises a plurality of continuous electrically-conductive traces (70A-70D) for connecting a first subgroup of the bond fingers to corresponding ones of the vias. The continuous traces including at least one trace interposed between a second subgroup of the bond fingers and their corresponding vias. The APAF shows all of the elements of the claims except the electrically conductive bridge. Takahama shows (fig. 3 and abstract) shows a semiconductor device having traces (3, 4, and 5) and a conductive bridge (8) in the form of a bond wire spanning in an overhead manner across the traces. The bond wire is free of the interposing traces and has an unfilled gap between the wire and traces. With this configuration, the density of wiring can be increased ultimately increasing the level of integration of the device. Therefore it would

Art Unit: 2815

have been obvious to one of ordinary skill in the art at the time the invention was made to modify the connections of the APAF by forming conductive bridges spanning over traces as taught by Takahama to increase the wiring density and ultimately improve the integration of the semiconductor device. Neither reference shows that the conductive bridge is a chip resistor. Abrams shows (fig. 1) a circuit in which crossover or conductive bridges are used to increase the packing density of the circuit (col. 2, lines 14-26). The electrically conductive bridge 26 spans in an overhead manner across interposing traces (22c & 22d) and connect one end of a trace 22b to the end of another trace 22a. There is a gap between the bridge and the interposing trace (that gap is filled with an insulating material). The bridge/crossover is made of gold wires or includes a resistor (col. 4, lines 3-6, & 25-31) and is free of interference with the electrically conductive trace due to the insulating material (27) between the bridge and traces. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the APAF and Takahama by employing conductive bridge structures such as chip resistors that cross over circuit traces as taught by Abrams to also increase the packing density of the circuit.

### ***Response to Arguments***

Applicant's arguments filed with respect to claims 6, 8, 11, and 13 have been fully considered but they are not persuasive. The applicant primarily argues that Takahama does not cure the deficiencies of the APAF 3 by showing an electrically conductive bridge is a bond wire (or chip resistor) for connecting bond fingers and vias and that the proposed combination is based on impermissible hindsight. The examiner believes that the combined references show all of the elements of the claims and the references have been combined properly. The APAF 3 showed all of the elements of the claims except the electrically conductive bridge spanning in an overhead manner across an electrically conductive trace and having an unfilled gap. The APAF 3 already taught the bond fingers and vias. Takahama was only cited to show the bridge spanning in an overhead manner across an electrically conductive trace and having an unfilled gap. Even though the bridge of Takahama is connected to semiconductor elements, the point of the combination is to show that a conductive bridge can make an electrical connection between electrical components, spanning in an overhead manner across an interposing trace, and have an unfilled gap. Furthermore, Takahama states in the abstract that device comprises jumper electrodes or "thick wires." As seen in Takahama (fig. 3) the thick wire (8) spans over an interposing conductive trace (or electrode 3). Thus Takahama clearly disclose the use of a bonding wire. Again, Abrams was cited to cure the deficiencies of the APAF and Takahama be disclosing a chip resistor in place of a bond wire.

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971). As stated in the rejection, Takahama clearly discloses in the Constitution portion of the references that the density of wiring can be increased while ultimately increasing the level of integration of the device. Therefore, rejection above is still proper.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew E. Warren whose telephone number is (571) 272-1737. The examiner can normally be reached on Mon-Thur and alternating Fri 9:00-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (571) 272-1664. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.



Art Unit: 2815

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MEW

*Mew*

February 22, 2005

*Tom Thomas*

TOM THOMAS  
SUPERVISORY PATENT EXAMINER